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ABSTRACT

This study of the nature and characteristics of thinking examined how university students without full-time work experience and university graduates with work experience think when posed with an indeterminate situation. The focus was on such characteristics as expression tendencies, approaches to responding, thinking movements, and learning enhancers. Subjects included 26 methods-course students in a teacher certification program, 17 university graduates with 5 years of full-time work experience (typically business), and 16 university graduates with 10 years of full-time work experience. Each subject performed two thinking operations out loud during a focused interview. Salient characteristics clusters resulting from the research are listed as "rough starts" of generalizations used to highlight a relationship of the clustered characteristics. These are provided as bases for the reader's own hypotheses for further study. Samples of these characteristics include: the more full-time work experience, the more succinct the responses; and the more inductive thinking, and the more critical thinking, and the less work experience, the more probable fallacies in thinking. Examples of key idea stimulants and insights from the research are provided as an approach to trigger further hypothesis development. (JDD)

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**CHARACTERISTICS OF ATTEMPTS TO HANDLE INDETERMINATE SITUATIONS--
ANSWERING QUESTIONS: UNIVERSITY STUDENTS AND UNIVERSITY
GRADUATES WITH WORK EXPERIENCE**

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**Excerpts Presented at the Annual Meeting of the
American Educational Research Association
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Nothing is more important to the educator, especially in business and in education, than understanding the nature and characteristics of how employees and students think. Until such educator fully knows (and can finally defend) what thinking actually is, its dimensions, and how it is done, the need exists for continual research investigations of the dimensions of thinking. Research on thinking is crucial (Gardner, 1985; Lazear, 1991; Sternberg, 1988). This study should shed more light on this important, underlying essence of human functioning in today's modern society.

The research is the second phase of a research project, the findings of the research from the first phase having been presented at the 1993 AERA annual meeting. That research concerned students' views of their and others' thinking--underlying concepts involved in answering divergent questions.

Thrusts

The focus of this research is on other selected major characteristics of the thinking of university students as well as of two groups of university graduates--one group with 5 years of full-time work experience and the other with 10 years.
//

The study is a further contribution to understanding the nature and characteristics of thinking. The idea of both phases of the research is to provide an enlarged perspective--qualitative: conceptual/philosophical--in two dimensions. These are (1) a basis for insight into how these university students basically without a year of full-time work experience and these two groups of university graduates with work experience think when posed with an indeterminate situation and, thus, (2) a basis for hypotheses for better understanding thinking itself.

In providing a foundation for improved general understanding of how students and graduates think, both phases of the study should initially stimulate better insight into specific characteristics involved in the thinking of these students and graduates in a given indeterminate situation. Contributing ideas

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of such specific characteristics should shed light on the broader nature and characteristics of human thinking. Dimensions of such bases for personal considerations of thinking in general and for generation of hypotheses for further, perhaps comprehensive inquiry of, specific thinking may be of use to many varieties of school-based and business-based educators and administrators, regardless of their work locations and assignments.

Key directional clusters. As a portion of a larger investigation and as its second phase, this study concerns four special arenas of characteristics of the thinking of university students with little/no work experience, of university graduates with 5 years of full-time work experience, and of other university graduates with 10 years of full-time work experience.

Key data and their flows generated, captured, and studied to derive foundational thrusts as minimum clusters in the study include major agreements and major differences among the groups. The focus is on such characteristics as expression tendencies, approaches to responding, thinking movements, and learning enhancers.

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Use of Sources and Data

Qualitative methods yielded this general theme conceptual/philosophic study. Drawn from the observations and projective/perceptive assessments made during individual interviews comprising an extensive data base of cases were 59 isolated cases appropriate for this study. Each case subject performed two thinking operations out loud during a focused interview.

Responses as answers to divergent questions (one question stimulated by research of Perkins, 1992) were recorded and studied to serve as the basis for this research. Twenty six methods course students (typically juniors with no full-time years of work experience) in a teacher certification program in a large midwestern university, 17 university graduates with five years of full-time work experience (typically business), and 16 other university graduates with ten years of full-time work experience (typically business) participated.

//

Major Insights: Characteristics Clusters

Data layers mirrored from the three groups--students, graduates with 5 years of full-time work experience, and other
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graduates with 10 years of full-time work experience--provided a basis for yielding salient characteristics clusters. Such clusters are revealed below, each under the start of a probable guiding generalization, a start as each participant performed out loud only two thinking operations. The reader should note that each rough start of a generalization given with highly rough estimates of support is used only to highlight a relationship of the clustered characteristics yielding it. Those generative, clustered data as well as the rough generalization start are provided as bases for the reader's own hypotheses for further study of such groups of students and graduates:

--The less the full-time work experience, the more discursive the responses?

//

--The more the full-time work experience, the more succinct the responses?

//

--The more the full-time work experience, the more the use of such heuristics as models, paradigms, and analogies?

//

[Other noted heuristics were metaphors, frames of reference, cognitive schemes, and similar thought hooks.]

//

--Typically complete thought responses, but occasionally short thought unit ones?

//

--The more the work experience, the somewhat shorter the sentences used in the responses?

//

--The less the work experience, the more the use of "I" in responding; the more the work experience, the somewhat more the reference to "one"?

//

--The more the work experience, the more the use of appropriate expression and good grammar?

//

[General weaknesses included wrong use of objective case, subjunctives, prepositions and tenses; no subject-verb agreement; lack

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of parallelism; awkwardly worded phrases,
 clauses, and sentences; incoherent and
 ambiguous thought; and wrong word choice.]

//

--The more the work experience, the less the being
 vocal on how a teacher/workshop leader could best
 help one's learning?

//

--Assistance typically sought in best helping
 one learn?

//

--The more the work experience, the more the seeking
 of needed important information from others?

//

--Typical interest in a teacher/workshop leader's
 personal characteristics as well as in the
 instructional characteristics?

//

--The less the work experience, the somewhat less
 the interest in the teacher/workshop leader's
 personal characteristics?

//

--The more the work experience, the more the
 inductive thinking?

//

--Somewhat different emphases in the use of Bloom's
 three higher thinking levels in the cognitive
 domain?

//

[Students may focus more concerning synthesis
 (most) and concerning analysis than
 concerning evaluation; graduates with 5 years
 of full-time work experience may focus more
 concerning analysis (most) and concerning
 evaluation than concerning synthesis; other
 graduates with 10 years of full-time work
 experience may focus more concerning analysis
 (most) and synthesis and evaluation?]

//

--The more the work experience, the more the
 inclusion of characteristics of noticeable
 critical thinking?

//

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--Minimal probable characteristics of creative thinking evidenced?

//

--The less the work experience, the somewhat more the probable fallacies in the thinking?

//

Other Dimensional Bases

The following dimensions also may be used for developing the reader's hypotheses. The dimensions are simply for note in passing, not being the primary focuses of this study, but should aid the reader's insights: response times to questions (slightly noticed is that students might have responded somewhat more quickly); bright light affects; levels of attention (slightly noticed is that graduates might have been somewhat more attentive); mental processing speeds (or such speeds in light of physical fitness/aerobics); encoding, retrieving, etc. (whether multiple subsystems or componential analysis thrusts); social/cultural abilities; specific situated or not cognition or this/these and biological, information processing, or social views or memory (such as declarative, explicit or nonsymbolic); and age/gender affects (or age versus efficiency in problem solving). Such important dimensions as the above provide fertile generative bases for the reader's hypotheses.

Scripts and Schematics as Stimulants

An approach to trigger further hypotheses is provided below through examples of key idea stimulants. During study of such phenomena as those presented in the previous sections, the reader attempting to develop hypotheses might select, string, script, and ponder use of such key ideas as:

heuristics. . . . seeking information from experts. . . .
analysis/synthesis/evaluation. . . .

heuristics. . . . seeking information from experts. . . . more
inductive than deductive. . . . high critical thinking. . . .
"one" [might]. . . .

"one" [might]. . . . appropriate expression, shorter sentences,
more succinct. . . .

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or such as the following:

- "efficiency of"
- "effectiveness of"
- "function of"
- "improvement of"
- "continued existence of"

or such others:

- "appropriate use of"
- "needs/desires for"
- "dynamic modeling of"
- "refinement of"
- "multidynamics of"
- "ascription of"
- "enrichment of"
- "metaphorical analogies of"
- "disorder's 'orderly' patterns of"
- "empowerment of"
- "stabilizing constraints of"
- "drawing forth the capacities of"

Passing Ideas as Cues

Provided below are examples of ideas the reader may muster while studying the research. Such examples give another basis for development of hypotheses:

What life experiences in general or work experiences in specific help people to be more intuitive in handling divergent questions? To be more able to use heuristics well? To be more capable of seeing and framing problems and their solutions? What cluster of extra years of life makes a difference in an adult's handling indeterminate situations well? What real-world experiences with problems are important? What types of work experience help most? What role does social experience play? Turbulent periods? How do collaboration and teamwork contribute? Motives and will? What transitions or transformations are noted from life and work experiences? What are the levels of meaning?

To what does each member (of the student group or of either group of graduates) attribute as his/her "way" or "style" of thinking or of handling such indeterminate situations as answering divergent questions? How long has it (have they) been

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attributed? Why is it (are they) attributed? How? Is metacognition included? What about the esthesia? How is affect involved (Clark & Fiske, 1982)? What limbic system dimensions operate? Any spiritual aspects? Dissipative structures of mental "models"? Do the older members up to the end of middle age more logically organize thoughts about and manners of approach for divergent situations than those members 15 years younger? Or than those members 15 years younger than that? Why or why not? Do those beyond middle age? Do the elderly? Why or why not?

What contributions do such forces as conscious language functions and unconscious perception and valuing make in handling such indeterminate situations as answering divergent questions? What ascriptions are appropriate? Consider such interrelated purposive communication language functions as those which are instrumental, regulatory, representational, interactional, personal, heuristic, and imaginative (Halliday, 1973). Consider theories of nonpurposive communication and of unconscious communication. Or of nonlinear functions such as learning? Any recursive patterns, functions, symmetries or other characteristics? Any significant note of probable functioning of past self or future self? Probe notions of valuing. Any important unexplained worldview changes? How do such influences as novelty, excitement, and joy impact handling such indeterminate situations as answering divergent questions? How do humiliation, contempt, shame, and guilt?

When one considers that he/she has thought extremely well or handled answering divergent questions extremely well, what relationships exist among that and any aspects of the environment and/or of the situation in which that cognition occurred? Is attitude considered? If this "extremely good" performance were compared with any other natural thinking or handling of such indeterminate situations as answering divergent questions, what similarities and differences would exist? Why? What are the roles of courage and action? Any important semiotic identifiers? If the "extremely good" performance were compared with what could be considered an "extremely bad" performance, what similarities and differences would exist? Why?

How does the reader actually perceive a schematic or pattern of the functioning of any of these groups in this study? That (even a process or product) is itself

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worthy of study. What is the role of construction? Of internal guidance? Of dissipative mental models? Of useful randomness? Of predictable structuring? Any recursive aspects? What is the mental tapestry? What is in the mind of the reader which influences what was noted? Fractal nature of thought? Specify insights as to why the reader feels that such schematic or pattern is probably realized. What is the role of imagery? Identify uses of such "knowing" or "owning" of an image of any of the three groups in this study. How are patience, imagination, reflection, and rumination entailed? Or beliefs? What are the forces in the implicit knowledge? How do you know?

//

Selected Bases for Insights:

Viewing this research, as the second phase of a larger research study, as added to portions of the earlier phase yields an even broader foundation for hypothesis development. To aid the reader's development of such hypotheses, the following selected ideas are also included:

Reflection is continually needed on the roles of such underlying influences as the following upon the thinking and the handling of indeterminate situations by the student or by the graduate with work experience: conscious and unconscious perception and acquisition; physiological and biochemical changes from learning, ideas, and events; planned and unplanned or serendipitous purposing; physical, cultural, social, emotional, psychological, and spiritual dimensions; egocentric influences; as well as progressive maturity, aging, and increasing experiences of living; intellectual, communicative, expectancy, cognitive, motivational, attitudinal, value, sensory, metacognitive, interest, affective, and educational focusing and domains; and achievement, accomplishment, and mental effectiveness.

Deliberations on data relating to major questions probing other specific units, slices, change, progress, or relationships of the phenomena should yield further hypotheses. Such questions might include:

What are the nature and characteristics of any adjustment of any type one has in thinking and in handling divergent situations during the transition from being a student to being a graduate with a full-time job? Or to having completed a few months of such employment? Or to having completed a year or two of

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the work experience? Or to having completed 5 years of it? Or to having completed 10 years? Important insights from the changes? Any dynamic worldview changes, transformations, or transitions?

What are the major impacts which the student can identify on his/her thinking and on his/her handling of such indeterminate situations as answering divergent questions? What ones can the graduate with 5 years of full-time work experience identify? Why? Attracted to the strange impacts? What ones can the other graduate with 10 years identify? Why? Any self-organization aspects? How does knowledge of any entailed content area contribute? Any stimulation of lifelong learning?

Which factors does the graduate with 10 years of full-time work experience recognize (as impinging upon his/her thinking and handling of such indeterminate situations as answering divergent questions) as being different in any way from those functioning 5 years earlier? What new ones exist? Why? Which factors does the other graduate with 5 years of full-time work experience recognize as being different in any way from those functioning when he/she was a student 5 years earlier? Initial stimuli sensitivity? What new factors exist? Why?

How does each member (of the student group or of either group of graduates) think or handle such indeterminate situations as answering divergent questions in his/her everyday environment and everyday life? Does this differ across contexts? If so, how? What things are situation specific? How do you know?

To what extent does the student in his/her studies and schooling perform thinking and handling indeterminate situations the same way as revealed in answering divergent questions in this study? Is the performance the same in the daily life? If differences exist, which ones and why?

To what extent does each graduate with work experience (5 or 10 years) perform thinking and handling indeterminate situations in his/her work assignment the same way as revealed in answering divergent questions in this study? Is the performance the same in the daily life? If differences exist, which ones and why?

What are the nature and characteristics of any major changes one has in thinking and in handling

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divergent situations from age 19 for each of the later consecutive 10 year periods until retirement? [Cerella, Rybash, Hoyer, & Commons (1993)] Until senility? How unpredictable? Stability levels? Or, until retirement or until senility, what are the nature and characteristics of any major changes at any time in thinking and in handling divergent situations? Paradigm shifts? Shadow theories? How do chaos theories/ideas impact? Multiple-self theories? Or novice-to-expert theories?

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